

We claim:

1. A method of locating a football on a field of play and determining whether a first down has been achieved pursuant to the rules of the game comprising the steps of:

5 providing at least one portable display device having a micro-controller and an associated system memory, a transceiver for sending and receiving wireless data and an operator interface;

10 providing at least one distance measuring device having a means for sending and receiving light pulses, a transceiver capable of wireless communication with said digital display device and an operator interface,, said distance measuring device disposed at a known location relative to said field of play;

15 placing a reflector proximate the nose of said football when said football is resting at an initial location to reflect a light beam from said measuring device back thereto;

20 calculating a first position of said football at the initial location on said field of play relative to a mid-field line using said distance measuring device;

25 placing a reflector proximate the nose of said football when said football is resting at a second location to reflect a light beam from said measuring device back thereto;

calculating a second position of said football at the second location on said field of play relative to the mid-field line using said distance measuring device;

30 determining whether a first down has been achieved by comparing the first and second calculated positions of said football; and

displaying whether a first down has been achieved on said portable display device.

2. A method of locating a football on a field of play and determining whether a first down has been achieved pursuant to the rules of the game as claimed in claim 1 wherein the steps of calculating first and second positions of said football further comprise;

calculating a distance from the reflector proximate the football to the distance measuring device;

measuring the angle between the mid-field line and a line drawn between the distance measuring device and the reflector wherein said distance and angle represent the position of the nose of said football in polar coordinates relative to the position of said distance measuring device; and

transmitting the distance and angle of the first and second positions of said football to said portable display device.

3. A method of locating a football on a field of play and determining whether a first down has been achieved pursuant to the rules of the game as claimed in claim 2 wherein the step of determining whether a first down has been achieved comprises:

converting the distance and angle of the first and second positions of said football into corresponding Cartesian coordinates wherein the x-axis represents the distance towards or away from a goal line from the mid-field line; and

calculating the absolute value of the difference between the x-coordinates of the first and second positions of said football wherein an absolute value greater than or equal to ten yards represents a first down.

4. A method of locating a football on a field of play and determining whether a first down has been achieved pursuant to the rules of the game as claimed in claim 1 comprising the further step of:

5 transmitting whether a first down has been achieved to a scoreboard device for display.

5. A method of locating a football on a field of play and determining whether a first down has been achieved pursuant to the rules of the game as claimed in claim 1 further comprising the step of:

storing the first and second positions of said football in said portable display device memory; and.

replacing the first position of said football with the second position of said football in memory when a first down is achieved.

6. An apparatus to locate a football on a field of play and determine whether a first down has been achieved according to the rules of the game comprising:

a portable display device having an operator interface for initiating a measurement and reviewing the results thereof and having a transceiver for sending and receiving data;

a distance measuring device having a means for generating a light pulse, a means for detecting the light pulse when reflected, a means for measuring the time elapsed between sending a light pulse and detecting the reflected light pulse, a computer means for calculating the position of a target relative to said distance measuring device, and a transceiver for sending and receiving data capable of communication with said portable display device; and

a reflector to place proximate the nose of a football for reflecting the light pulse back to said distance measuring device.

5 7. An apparatus as claimed in claim 6 wherein said portable digital display device further comprises:

10 a heater control circuit for maintaining a desired temperature for said portable display device comprising a temperature sensor having an output representative of temperature connected to an input of a micro-controller, said  
15 micro-controller having a pulse-width modulated output electrically connected to a transistor switch, and a plurality of transparent thin film heater elements electrically connected to a power source through said transistor switch, wherein said micro-controller varies the pulse-width modulated output to maintain a temperature sufficient to allow operation of said display device during cold-weather.

20 8. A method of locating a football on a field of play and determining whether a first down has been achieved pursuant to the rules of the game comprising the steps of:

25 providing at least one portable display device having a micro-controller and an associated system memory, a transceiver for sending and receiving wireless data and an operator interface;

30 providing at least one distance measuring device having a means for sending and receiving light pulses, a transceiver capable of wireless communication with said digital display device and an operator interface, said distance measuring device disposed at a known location relative to said field of play;

reflecting a light beam from said measuring device to said football and back when said football is in a first position for measuring the distance from said measuring device to said football;

5        calculating a first position of said football at the initial location on said field of play relative to a mid-field line using said distance measuring device;

reflecting a light beam from said measuring device to said football and back when said football is in a second position position for measuring the distance from said measuring device to said football;

calculating a second position of said football at the second location on said field of play relative to the mid-field line using said distance measuring device;

15        determining whether a first down has been achieved by comparing the first and second calculated positions of said football; and

displaying whether a first down has been achieved on said portable display device.

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